DEPARTMENT OF ENERGY
FY 2002 CONGRESSIONAL BUDGET REQUEST

FOSSIL ENERGY RESEARCH AND DEVELOPMENT

OIL TECHNOLOGY

I. **Mission Supporting Goals and Objectives**:

The oil research program, in partnership with industry and its stakeholders, will develop cutting edge technologies to better find and produce petroleum and convert it into transportation products while minimizing waste production and environmental damage. This program will demonstrate the effectiveness of these technologies to support the Nation's energy security and science and technology leadership goals through studies in the areas of extraction technologies, fundamental chemistry, processing, and reservoir characterization. This leadership is also supplemented by teacher training programs, student and faculty internships, as well as a broad program of university research. Minority participation in science is addressed through the Minority Education Initiative.

Federal Roles and Responsibilities in Oil Technology Research are to: (1) provide strategic guidance for national energy policy; (2) support efficient use of domestic energy resources; (3) protect the environment and public safety; (4) enhance the value of Federal lands and future supply and more complex environmentally sensitive areas (27% of oil production is on Federal lands); (4) enhance global market opportunities for U.S. energy technologies; (5) contribute to U.S. science and technology leadership; (6) apply a unique national perspective to technology development that is independent of company-specific or State-specific interests; and (7) foster the use of new technology through a nationwide technology transfer network.

The key sections of this program are: (1) Exploration and Production; (2) Reservoir Life Extension and Management; and (3) Effective Environmental Protection. Program planning and support and technology transfer are integral components of each of the key areas. The DOE National Petroleum Technology Office (NPTO), an arm of the National Energy Technology Laboratory (NETL), located in Tulsa, Oklahoma, manages all oil technology program implementation activities.

Because reliable domestic energy supplies are vital to the Nation's economy, this program conducts projects designed to enhance the efficiency and environmental quality of domestic oil operations. These R&D programs are conducted in partnership with industry,

I. **Mission Supporting Goals and Objectives**: OIL TECHNOLOGY (Cont'd)

universities, National Laboratories, State and local governments, and other organizations. Private sector participation is emphasized through industry cost-sharing with individual companies and consortia to ensure market relevance and to facilitate the transfer of technology to the private sector while leveraging Federal R&D investment. Near-term efforts are focused on transferring state of the art technologies to independents and long-term research and development of novel or revolutionary technology advances.

Exploration and Production research consists of Advanced Drilling, Completion, and Stimulation systems (ADCS), Advanced Diagnostics and Imaging Systems (ADIS), Reservoir Efficiency Processes, and Planning and Analysis efforts. The ADCS work focuses on developing enabling technologies to drill, complete and stimulate oil wells, as well as improving the efficiency of surface operations. This provides a balanced portfolio of technologies to match the diverse geologic formations, approach technologically challenging environments, increase exploration success, improve producibility of wells, minimize formation damage, reduce operating costs, improve flowability and minimize potential environmental damage.

The ADIS work focuses on the development of technologies and methodologies that more clearly define petroleum reservoirs and associated reservoir rock, fluid distributions and rock-fluid interactions that impact producibility. The development and application of advanced diagnostic and imaging systems improves the success rates and cost efficiencies for new field discoveries and the development of existing fields. The program conducts research to develop technologies to better define oil reservoirs in increasingly geologically complex environments which often occur in deeper and higher temperature and pressure regions such as the sub-salt and ultra deep regions of the Gulf of Mexico.

The Multi-National Lab/Industry partnership line item has been eliminated due to funding constraints. National Lab research and development will be pursued within technology line items. Future mechanisms for work with National Labs will be determined based on funding levels and type of research needed.

Reservoir Efficiency Processes includes research to develop and demonstrate tools and methodologies that permit oil operators to recover hydrocarbons from known reservoirs not producible by current technology. It also supports university research in extraction technologies and recovery-process modeling to ensure a supply of well-trained workers. The program is directed toward oil, unrecoverable with current technology, through advanced methods while at the same time helping the smaller producer with day-to-day

I. **Mission Supporting Goals and Objectives**: OIL TECHNOLOGY (Cont'd)

problems. The main areas of research are chemical methods, gas flooding methods, microbial methods, heavy oil methods, novel methods and reservoir simulation.

The Planning and Analysis area supports the program by providing accurate data on the oil resource, supply and utilization trends, industry activities and R&D needs, assuring that legislative, regulatory and policy initiatives in oil supply, environmental and processing are based on the best available information to support program goals. This area also supplies analytical systems used to prioritize RD&D efforts and evaluate oil recovery and utilization over a wide range of technological and economical conditions.

Reservoir Life Extension/Management work focuses on advanced technologies for extraction of hydrocarbons from known, or discovered, oil reservoirs. These activities provide improved technology and/or more efficient methods to recover more of the discovered but unproduced domestic oil resource, and increase recovery of oil from Federal lands. Laboratory research and evaluation of past advanced field trials in large, promising Class 1, 2, and 3 reservoirs will be completed. Demonstration and testing of technologies specifically targeted for independent operators will be continued.

The technologies are conveyed to industry users through an aggressive technology transfer program implemented at the National Petroleum Technology Office (NPTO) through widespread distribution of project results to industry, universities, other government agencies, and the general public; support for tutorial workshops on the application of oil technologies; and development of software for improved reservoir management, exploration and development activities. NPTO also strongly supports the extensive and highly successful technology transfer work being accomplished through the Petroleum Technology Transfer Council with its 10 regional centers.

The preferred Petroleum Upstream Management Practices (PUMP) program is designed to provide a short-term supplement to long-term R&D. PUMP will delineate preferred management practices in three technology areas: advanced oil recovery; data management; and effective environmental compliance. The program will focus on projects that promote an expedited application of technologies or approaches that will develop best practices databases, and use existing technology transfer mechanisms to address a regional need or issue. These projects are designed to provide integrated solutions to technological, regulatory, environmental and data constraints and must have quick implementation and rapid results in order to increase the near-term oil supply.

I. **Mission Supporting Goals and Objectives**: OIL TECHNOLOGY (Cont'd)

Effective Environmental Protection research activities focus on technologies and practices that reduce the threat to the environment and decrease the cost of effective environmental protection and compliance involved in oil exploration, production, and processing. The activities are distributed into four program elements: risk assessment, regulatory streamlining, technology development, and program planning and analysis. Program goals are to maximize industry recovery, processing, and utilization of U.S. oil resources by reducing the cost of effective environmental protection. The program works to reduce the cost of environmental compliance through a combination of risk assessment, technology development, regulatory streamlining, impact analysis, and facilitating dialogue that attempts to achieve consensus among the affected parties on ways to balance the need to develop the Nation's energy resources while maintaining our environmental values. This program fills critical data gaps allowing the introduction of new refining processes needed to meet future transportation fuels through reduction of environmental risks and cleanup as well as improved permitting systems.

Performance Measures:

- Continue to develop methods to reduce the amount of produced water by improving conformance control methods
- Continue improvements in geophysical data acquisition, processing and interpretation technologies to increase resolution and accuracy of complex (including naturally fractured reservoirs) .
- Complete air tracer sampling using a small, remotely controlled blimp to determine the actual impact of oil and gas activities on regional pollution problems in the San Joaquin Valley.
- Continue analysis and risk-based protocols for fine particulates for effective promulgation of proposed regulations.
- Complete bench-scale development of a down-hole oil-water separator that meets industry needs for volume, water-cut, and solids production.
- Demonstrate safe economic slimhole drilling technology in actual use under Arctic conditions.

II. A. **Funding Schedule**:

Activity	FY 2000	FY 2001	FY 2002	$Change	%Change
Exploration and Production	$27,666	$28,844	$20,350	$-8,494	-29%
Reservoir Life Extension/Management	14,305	14,662	4,849	-9,813	-67%

Activity	FY 2000	FY 2001	FY 2002	$Change	%Change
Effective Environmental Protection	10,534	10,796	5,300	-5,496	-51%
Emerging Processing Technology Applications	3,243	2,594	0	-2,594	-100%
Ultra Clean Fuels	0	9,978	0	-9,978	0%
Total Oil Technology	$55,748	$66,874	$30,499	$-36,375	-54%

II. B. **Laboratory and Facility Funding Schedule**: OIL TECHNOLOGY (Cont'd)

	FY 2000	FY 2001	FY 2002	$Change	%Change
Argonne National Lab (East)	$450	$250	$0	$-250	-100%
Brookhaven National Lab	0	200	0	-200	-100%
Idaho Natl. Engineering & Environmental Lab	925	807	0	-807	-100%
Lawrence Berkeley Lab	1,405	1,115	0	-1,115	-100%
Lawrence Livermore National Lab	600	600	0	-600	-100%
Los Alamos National Laboratory	550	176	0	-176	-100%
National Energy Technology Lab	0	500	200	-300	-60%
Oak Ridge National Laboratory	1,385	1,777	100	-1,677	-94%
Pacific Northwest National Lab	0	200	0	-200	-100%
Sandia National Laboratories	450	300	0	-300	-100%
All Other	49,983	60,949	30,199	-30,750	-50%
Total, Oil Technology	$55,748	$66,874	$30,499	$-36,375	-54%

III. **Performance Summary**:

Activity	FY 2000	FY 2001	FY 2002
Exploration and Production	Advanced Drilling, Completion, Stimulation: Continue capability upgrades that allow the advanced research and high temperature/	Advanced Drilling, Completion, Stimulation: Continue capability upgrades in Phase 4 of the unique Advanced Cuttings Transport	Advanced Drilling, Completion, Stimulation and Operations: Continue capability upgrades in Phase 5 of the unique Advanced

Exploration and Production (Cont'd)	high pressure experimentation for prediction of the rheology of and cuttings transport in energized fluids (air, mist, gas assisted, foam, etc.) in horizontal and inclined wellbores using the DOE HP/HT Flow Loop. Continue research on the development of three-phase separation technology that provides for lower costs, improved efficiency, and a reduced footprint on a onshore production pad or offshore platform. Continue to upgrade and expand the current DOE suite of risk based decision-making tools used most by industry. Continue development of advanced downhole sensor technology using fiber optics. Continue research in efficiency of well stimulation. Complete project to optimize horizontal well completions. Continue development research on a downhole positive displacement motor for coiled tubing drilling. ($2,508) (Univ. of Tulsa, WU, LANL, INEEL, Va. Polytech, Univ. Houston, PRRC, AWU, TBD)	Facility that allow research on high temperature/high pressure experimentation for prediction of the rheology of and cuttings transport in energized fluids (air, mist, gas assisted, foam, etc.) in horizontal and inclined wellbores using the DOE HP/HT Flow Loop. Complete development and field testing of advanced downhole sensor technology using fiber optics. Initiate new projects in Stimulation. Add to the current suite of risk-based decision-making tools. ($2,502) (PRRC, Univ of Tulsa, Va Polytech, WU, LANL, Univ of Houston, TBD)	Cuttings Transport Facility that allow research on HT/HP experimentation on energized fluids (air, mist, gas assisted, foam, etc.) and synthetic drill fluids in horizontal and inclined wellbores onshore and offshore. Complete the risk based decision-marking software. Continue research efforts in Completion and Stimulation with the national labs. Support specific consortia and joint industry collaborations that enhance the Program goals. ($2,500) (PRRC, Univ of Tulsa, Natl. Labs, TBD)

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Exploration and Production (Cont'd)	Advanced Diagnostics and Imaging Systems: Continue advanced reservoir diagnostic and imaging systems work including, advanced microseismic mapping, geomechanical influences on reservoir during depletion/ repressurization, and EM process sensing with industry for large producing reservoirs to optimize oil recovery while minimizing environmental risks. Study relationships between seismic and acoustic measurements and reservoir properties; apply results to improved management of oil recovery. Continue development of advanced imaging technologies and algorithms, NMRI and Cat-Scan for quantitative analysis of reservoir rock architecture and fluid distribution. Develop technologies for accurate measurement of mulitphase relative permeabilities in steady and unsteady-state conditions under broad temperature and pressure conditions, and investigate	Advanced Diagnostics and Imaging Systems: Continue advanced reservoir diagnostics and imaging systems work including; relationships between seismic measurements and reservoir properties; and EM process sensing to optimize oil recovery. Technology development including NMRI and Cat-Scan for quantitative analysis of reservoir rock architecture and fluids distribution to quantify understanding of how wettability, imbibition, in-situ relative permeability, as well as other engineering parameters are controlled by rock-fluid interactions and impact oil production. Continue developing integrated geological, geophysical and engineering data and methods for upscaling these varied databases, to predict areal and vertical distributions of the reservoir architecture and fluid flow patterns for more accurate geologic and engineering modeling	Advanced Diagnostics and Imaging Systems: Continue development of advanced reservoir diagnostics and imaging systems work to optimize oil discovery and recovery. Develop quantitative engineering parameters that control rock-fluid interactions which impact oil production. Develop larger scale remove sensing techniques and the integration of multiple geological, geophysical and engineering data, at the field- to basin-scales for the development of more accurate geologic and engineering models needed in exploration and in simulation of production/EOR/ IOR activities. Continue fundamental geoscience efforts focusing on geoscience/ engineering reservoir characterization on naturally fractured reservoirs. Continue development of hydrocarbon predictive tools for exploration, sedimentary modeling, development of lithostratigraphic models and fluid transport models in selected U.S. basins. ($6,904)

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Exploration and Production (Cont'd)	influences of rock-fluid interactions on these critical parameters. Develop integrated geological, geophysical and investigate influences of rock-fluid interactions on these critical parameters. Develop integrated geological, geophysical and engineering data and methods for predicting areal and vertical distribution of reservoir architecture and mobile oil flow patterns, using methodologies for upscaling to the interwell scale for infill drilling and EOR/IOR, thus minimizing numbers of infill wells, surface footprints and associated environmental effects. Continue fundamental geoscience involving geoscience/engineering reservoir characterization for a variety of reservoir types and depositional environments to optimize field development and management while minimizing environmental exposure. Study the framework and controls of hydrocarbon generation in the South-Central	and simulation to optimize development, production, and EOR/IOR activities. Continue Fundamental Geoscience procurement involving the geoscience/ engineering reservoir characterization of fractured reservoirs to optimize oil recovery. Continue development and testing of a hydrocarbon prediction tool for exploration; sedimentary modeling programs using advanced algorithms, expert theory, and importing climatic models to complete detailed lithostratigraphic models; and a model for hydrodynamic fluids transport in the Uinta and Paradox Basins. ($7,029) (LLNL, LBNL, ORNL, ANL, INEEL, RERI, Stanford, Cal Tech, 8 MegaPRDA contracts, PRDA-TBD)	(FE-PS contracts, CalTech, PRIME, National Laboratories, TBD)

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Exploration and Production (Cont'd)	Appalachians. Investigate reservoir pressure/gas saturations, wettability and matrix block size on spontaneous imbibition in fractured reservoirs for improved oil recovery. Continue development of sedimentary modeling programs using advanced algorithms, including the continued development of comprehensive detailed lithostratigraphic/climatic models including the continued development of comprehensive detailed lithostratigraphic/climatic models integrated sedimentary basin modeling. Continue Basin Analysis and research on the Onshore Gulf of Mexico in Alabama and Mississippi. ($6,984) (LLNL, SNL, ORNL, LBNL, Stanford, RERI, ANL, , Univ. of Alabama, NRC, Cal Tech, 9 Program Solicitation awards, 7 PRDA mortgages)		
	Multi National Lab/Industry Partnership: Continue to adapt and transfer technologies that advance understanding of the characteristics	Multi National Lab/Industry Partnership: Continue to adapt and transfer technologies that advance understanding of the characteristics	No activity. ($0)

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Exploration and Production (Cont'd)	and producibility from oil reservoirs, optimize the performance of production tools and processes, reduce environmental footprint and waste emissions and improve reservoir management resulting in higher oil recovery through leveraging of industrial, oil program and other public funds. Continue to integrate high performance National Lab computational capabilities to address difficult problems such as subsalt imaging, testing of advanced exploration concepts and multiphase flow in subsea pipelines. ($7,416) (9 National Labs)	and producibility from oil reservoirs, optimize the performance of production tools and processes, reduce environmental footprint and waste emissions and improve reservoir management resulting in higher oil recovery through leveraging of industrial, oil program and other public funds. Continue to integrate high performance National Lab computational capabilities to address difficult problems such as subsalt imaging, testing of advanced exploration concepts and multiphase flow in subsea pipelines. ($7,400) (NL-TBD)	
	Reservoir Efficiency Processes: Continue the development of state-of-the-art reservoir simulation models and the development scaled down reservoir simulation models for desktop computers. Continue to advance thermal methods for heavy oil extraction and screen potential heavy oil recovery processes. Continue work to	Reservoir Efficiency Processes: Issue a solicitation to develop recovery processes for mature reservoirs. Continue development of improved sweep techniques, and state-of-the-art reservoir simulation models. Continue to develop microbial methods. Continue mechanistic studies to reduce surfactant adsorption and advance	Reservoir Efficiency Processes: Continue to develop recovery processes for mature reservoirs. Continue to support a Novel Surfactant Industry/University consortium for development of novel surfactants. Continue development of improved sweep techniques, and state-of-the-art reservoir simulation models.

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Exploration and Production (Cont'd)	improve reservoir sweep for gas flooding, especially for carbon dioxide flooding, by using foams and direct thickeners. Continue the development of microbial flooding techniques by developing genetically modified microbes. Continue to develop microbial methods to develop surfactant and other oil recovery agents from waste products which helps lower environmental damage from the disposal of these wastes. Continue mechanistic studies to reduce surfactant adsorption. Continue to advance the state-of-the-art in development of new polymers for oil recovery. Continue low cost oil recovery methods using wettability alternations and alkaline-surfactant-polymer(ASP). Continue work with Native American Tribes through targeted research work and training to increase oil recovery efficiency from Tribal lands in an environmentally and culturally sound manner. Continue work with the Tribes in the Black Mesa	the state-of-the-art in development of new polymers and gels. Continue to advance thermal methods for heavy oil extraction and novel processes which will aid oil recovery from naturally fractured reservoirs. ($6,840) (Univ of Kansas, Columbia Univ, Univ of Pittsburgh, Univ of Texas, Univ of Utah, Geo-Microbial, Univ of Southern California, Univ of Oklahoma, Stanford Univ, LBNL, INEEL, Univ of Kansas, Columbia Univ, Univ of Pittsburgh, Univ of Texas, Univ of Utah, Geo-Microbial, Univ of Southern California, Univ of Oklahoma, Stanford Univ, TBD)	Continue to develop microbial methods. Continue to advance the state-of-the-art in reservoir simulation. Continue mechanistic studies to reduce surfactant adsorption and advance the state-of-the-art in development of new polymers and gels. Continue to advance thermal methods for heavy oil extraction and screen potential heavy oil recovery processes. Continue to advance thermal methods for heavy oil extraction and novel processes which will aid oil recovery from naturally fractured reservoirs. ($6,800) (National Labs, FE-PS contracts, TBD)

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
	Basin ($6,794) (, INEEL, LBNL, NMIMT, TRW, Univ of Kansas, Columbia Univ, Univ of Pittsburgh, Univ of Texas, Univ of Utah, Geo-Microbial, Univ of Southern California, Univ of Oklahoma, Stanford Univ, 9 Program Solicitation awards)		

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Exploration and Production (Cont'd)	Analysis and Planning: Continue technical planning and analysis support for implementing and evaluating effective and efficient oil research programs. Conduct producibility assessment of major reservoirs, maintain and update the oil resource information base, enhance and maintain metrics capabilities for the Oil Program, enhance and maintain statistical data, models, and supporting systems for effective planning and continue technical and analytical support tasks. Continue project impact/oversight/analysis efforts. Support the contractor review workshop for program evaluation. ($3,680) (RMC, TRW, Univ. of Tulsa, EIA, TBD)	Analysis and Planning: Continue technical planning and analysis support for implementing and evaluating effective and efficient oil research programs. Conduct producibility assessment of major reservoirs, maintain and update the oil resource information base, enhance and maintain metrics capabilities for the Oil Program, enhance and maintain statistical data, models, and supporting systems for effective planning and continue technical and analytical support tasks. Continue project impact/oversight/analysis efforts. Support the contractor review workshop for program evaluation. ($3,792) (RMC, TRW, Univ. of Tulsa, TBD)	Analysis and Planning: Continue technical planning and analysis support for implementing and evaluating effective and efficient oil technology research programs. Enhance and maintain statistical data, models and supporting systems to evaluate petroleum policy options and to enhance metrics capabilities. Conduct efforts to validate the effectiveness of the oil technologies to meet programmatic and agency goals. ($3,200) (RMS, TRW, IOGCC, TBD)
	No activity. ($0)	Sonication: Conduct research benefitting the recovery of petroleum through the use of sonication or ultrasonic technology from other industries. ($993) (TBD)	No activity. ($0)

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Exploration and Production (Cont'd)	No activity. ($0)	Arctic Research: Establish an Arctic Research program for peer reviewed research; coordinate research conducted through Fossil Energy and Energy Efficiency; conduct outreach and serve as a liaison between the State and DOE. ($750 provided from Energy Efficiency appropriation.) (TBD)	Arctic Research: Continue Arctic Research program for peer reviewed research; coordinate research conducted through Fossil Energy and Energy Efficiency; conduct outreach and serve as a liaison between the State and DOE. ($742) (TBD)
	Fund technical and program management support. ($284)	Fund technical and program management support. ($288)	Fund technical and program management support. ($204)
	$27,666	$28,844	$20,350
Reservoir Life Extension/ Management	Recovery Field Demonstrations: Class 1-3 Revisit: Extend reservoir life to maximize oil recovery and improve environmental performance from our initial investment by revisiting major reservoir groups to address key production problems identified in previous work. ($6,472) (Ensign, Binger, Michigan Tech, Luff, U. of KS, TU, Plains-IL, Venoco,	Recovery Field Demonstrations: Class 1-3 Revisit: Extend reservoir life to maximize oil recovery and improve environmental performance from our initial investment by revisiting major reservoir groups to address key production problems identified in previous work. ($4,344) Identify the successes from previous Independents projects. Identify the	Recovery Field Demonstrations: Advanced Technologies: Evaluate and identify the most promising technologies in the Class, Class Revisit, and Research with Independents programs. Report the results to the public. ($580) (TBD)

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Reservoir Life Extension/ Management (Cont'd)	UGS, U. of Alabama)	most promising technologies identified in the Class Revisit or research with Independents projects and commence advanced research on two or three technologies. ($2,363) (Total $6,707) (Binger, Michigan Tech, Luff, U. of KS, TU, Plains-IL, UGS, U. of Alabama, Conoco, TBD)	
	Increase Production from Marginal Wells: Review the promising technologies identified in the Class Program and Class Revisit projects to identify one technology and commence advanced research work on that technology. Focus on the technology transfer of the results. Continue to focus on production problems identified by small operators by conducting cost-shared research with independents improved recovery or for reservoir management techniques on marginal wells at risk of abandonment. Improvement can	Increase Production from Marginal Wells, Native Americans Lands, and Independent Producers: Expand research and development with independents program to accelerate field testing and use of effective technologies by domestic oil industry. Identify best practices and lessons learned for aggressive technology transfer in the PUMP program. ($538) Native American Initiatives - Complete the targeted research projects initiated with the tribes in 1999 to benefit Native Americans, and prepare for the second round of projects. Continue	Increase Production from Marginal Wells and Independent Producer Properties: Expand the successful technology research and development with independents program to accelerate field testing and expand the use of effective technologies in areas dominated by the independent producers. Evaluate the success and failure of these projects for dissemination of "lessons learned". ($1,038) (TBD)

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Reservoir Life Extension/ Management (Cont'd)	come through decreased operating or environmental costs or improved equipment design. ($1,040) (Golder, Oil & Gas Consultants, Ft. Peck, 10 Independents awards)	successful training initiative for Native American decision makers. ($500) (Total $1,038) (Golder, Oil & Gas Consultants, Ft. Peck, TBD)	
	Technology Transfer: Continue technology outreach by supporting regional workshops providing complete packages of applicable results from Class Demonstration and other projects to assist oil producers in extending reservoir life in an environmentally acceptable manner; improve efficiency and coverage in electronic and hardcopy dissemination of publications and software; increase participation of Native American and HBCU students in expanded summer intern program of career-enhancing petroleum science research projects, continue teacher training program for elementary/secondary petroleum energy education;	Technology Transfer: Continue technology outreach by supporting regional workshops providing complete packages of applicable results from Class Demonstration and other projects to assist oil producers in extending reservoir life in an environmentally acceptable manner; improve efficiency and coverage in electronic and hardcopy dissemination of publications and software; continue training initiative for Native Americans; continue teacher training program for elementary/secondary petroleum energy education; expand schedule of exhibits at professional meetings and upgrade display materials and equipment.	Technology Transfer: Support PTTC regional workshops with publications, software and technical expertise; increase dissemination of information on independent operator participation in oil field demonstration program; support Minority Education Initiative through internships; and provide science teacher training in oil technology. These efforts will improve the ability to meet the technological and environmental information needs of domestic producers, support service industry elements, academic researchers, technical associations, and the public sector. ($2,783) (PTTC, RMC, TBD)

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
	expand schedule of exhibits at professional meetings and upgrade display materials and equipment.	These efforts will improve the ability to meet the technological and environmental needs of major and independent producers, support service industry elements, academic researchers, technical associations, and the public sector.) ($3,178) (PTTC, RMC, TBD)	
Reservoir Life Extension/ Management (Cont'd)	These efforts will improve the ability to meet the technological and environmental needs of major and independent producers, support service industry elements, academic researchers, technical associations, and the public sector. ($3,083) (PTTC, RMC, SPE, TBD)		
	Preferred Petroleum Upstream Management Practices (PUMP): Supplement the Oil Technology program that will use the best currently available technology and employ a variety of proactive technology transfer mechanisms to get operators to implement them in the field; includes environmental problem solving to address key regional constraints, and data management efforts aimed at reducing costs for industry and government. ($3,563) (TX RR,	Preferred Petroleum Upstream Management Practices (PUMP): Expand the FY 2000 work to include the creation of a database of "best practices" used successfully in areas such as 3-D and 4-D seismic, well logging, well design, enhanced oil recovery, risk assessment, and other oil recovery areas. Aggressively transfer these practices to industry through a proactive program of direct contact with producers. The environmental problem solving and	Preferred Petroleum Upstream Management Practices (PUMP): Compile results from the first round PUMP projects in specific producing regions of the Nation for the interactive, Internet-based DOE database of "preferred practices". ($400) (TBD)

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
	GWPC, TBD)	regulatory streamlining activities will be targeted to address key regional constraints in two regions using PUMP advanced oil recovery technology. ($3,592) (TBD)	
Reservoir Life Extension/ Management (Cont'd)			
	Fund technical and program management support. ($147)	Fund technical and program management support. ($147)	Fund technical and program management support. ($48)
	$14,305	$14,662	$4,849
Effective Environmental Protection	Program Planning and Analysis: Continue analysis of industry environmental trends and available technologies. Maintain performance measure data for program planning and technology transfer. Continue coordination with states, EPA and other Federal agencies to provide energy and economic analyses for longer term regulatory initiatives. Continue to perform legislative and regulatory impact analysis related to oil environmental issues. ($825)	Program Planning and Analysis: Continue analysis of industry environmental trends and available technologies. Maintain performance measure data for program planning and technology transfer. Continue coordination with states, EPA and other Federal agencies to perform and provide energy and economic analyses for legislative and regulatory initiatives related to oil environmental issues. ($823) (ANL, ICF, PERF, KWT/Aspen, TBD)	Program Planning and Analysis: Continue analysis of industry environmental trends and available technologies. Maintain performance measure data for program planning and technology transfer. Provide energy and economic analyses for legislative and regulatory initiatives related to oil environmental issues. ($500) (PERF, Natl. Labs, TBD)

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
	(ANL, , DynCorp, EPA, TBD)		
Effective Environmental Protection (Cont'd)	Streamline State/Tribal/Federal Regulations: Consistent with stakeholder needs, continue and enhance cooperative efforts with the states, tribes, and Federal agencies to streamline environmental regulations and regulatory processes to simplify regulations without compromising environmental protection. Enhance on-line expert environmental reporting and permitting systems to reduce costs to producers and regulators ($800). Generate independent quality scientific data to help implement national policy in streamlining and improving existing regulations and laws ($776). (Total $1,576) (IOGCC, ORNL, LANL, Nat'l Labs, Va Polytech, TBD)	Streamline State/Tribal/Federal Regulations: Continue and enhance cooperative efforts with the states, tribes, and Federal agencies to streamline environmental regulations and regulatory processes with emphasis on public lands. Enhance on-line expert environmental reporting and permitting systems to reduce costs to producers and regulators ($883). Generate independent quality scientific data to help implement national policy in streamlining and improving existing regulations and laws ($632). (Total $1,515) (ORNL, U. of KY, Nat'l Labs, TBD)	Streamline State/Tribal/Federal Regulations: Continue cooperative efforts with the states, tribes, and Federal agencies to streamline environmental regulations and regulatory processes ($610). Generate scientific data to facilitate policy makers' ability to develop and implement regulations ($390) (Total $1,000) (Natl. Labs, Univ. of Tulsa)
	Risk Assessment: Continue to provide credible scientific data for regulatory decision making. Continue research to assess and	Risk Assessment: Provide credible scientific data for regulatory decision making. Continue research to assess and mitigate	Risk Assessment: Provide credible scientific data for regulatory decision making in exploration and production, including risks posed

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Effective Environmental Protection (Cont'd)	mitigate environmental risks posed by exploration and production, including risks posed by injection for disposal and enhanced oil recovery, hydrocarbon or produced water spills, air emissions and management of oil field wastes. Continue assistance to States with research, analysis, and improved data management to support risk-based regulatory decisions consistent with stakeholder's objectives of streamlining and improving environmental regulations. Work with industry, states, and EPA to conduct research to help EPA make decisions based on sound science in the area of particulate matter emissions. Serve as a neutral third party between Federal and state regulators and the petroleum industry to develop scientific information on the environmental and health risks of pollutants emitted by the petroleum industry. ($4,601) (GWPC, Natl. Labs, ,	environmental risks posed by exploration and production, including risks posed by injection, spills, oil emissions, and management of drilling and production wastes. Assist States to support risk-based regulatory decisions consistent with stakeholder's objectives of streamlining and improving environmental regulations ($3,396). Develop credible scientific environmental and/or health information to assist EPA and States in implementing proposed regulations affecting fuel characteristics and composition end points for remediation of cleanup sites, and analysis of effects of fine particulate from petroleum processing and fuels. ($591). (Total $3,987) (GWPC, Natl. Labs, INEEL, ANL, BLM, LBNL, PERF, IGT, DynCorp, ORNL, KW Tunnell, TBD)	by injection, spills, oil emissions, and management of drilling and production wastes ($1,453). Develop credible scientific environmental analysis of effects of fine particulate from petroleum processing and fuels ($250). (Total $1,703) (Natl. Labs, BLM, PERF, GWPC, TBD)

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
	INEEL, ANL, ORNL, LLNL, LBNL, PERF, BLM, Univ of KY, IGT, KW Tunnell, MMS)		
Effective Environmental Protection (Cont'd)	Technology Development: Continue to develop and field test more cost-effective environmental compliance technologies in the areas of produced water treatment, remediation, air emissions control and monitoring, and oil field waste management and disposal ($1,451). Identify various pollutants present in petroleum and develop technology to prevent their formation. In keeping with PCAST recommendations, perform research to make fuels that have fewer emissions affecting global climate change ($1,973). (Total $3,424) (TBD, Natl Labs, ORNL, INEEL, PNL, OERB, ANL, TU, AWMA, LANL)	Technology Development: Continue to develop and field test more cost-effective environmental compliance technologies in the areas of produced water treatment, remediation, air emissions control and monitoring, and oil field waste management and disposal ($1,441). In keeping with PCAST recommendations, perform research to make fuels that have fewer pollutants and fewer emissions affecting global climate change ($2,922). (Total $4,363) (TBD, Natl Labs, ORNL, INEEL, PNL, OERB, TU, TBD-PS)	Technology Development: Continue to develop more cost-effective environmental compliance technologies for oil field waste management and disposal ($516). Perform research to reduce environmental impacts of processing this hemisphere's heavy crude oil to make high-quality fuels ($1,528). (Total $2,044) (Natl. Labs, TU, GEER)
	Fund technical and program management support. ($108)	Fund technical and program management support. ($108)	Fund technical and program management support. ($53)
	$10,534	$10,796	$5,300

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
Emerging Processing Technology Applications	The R&D activity will provide data to validate viability of biodesulfurization of diesel fuel for application in small refineries. ($3,210) (PetroStar)	The R&D activity will provide stat to validate viability of biodesulfurization of diesel fuel for application in small refineries. Initiate innovative processes research through competitive solicitation. Conduct in-house processing research at NETL. ($2,568) (PetroStar, NETL, TBD)	No activity. ($0)
Emerging Processing Technology Applications (Cont'd)	Fund technical and program management support. ($33)	Fund technical and program management support. ($26)	No activity. ($0)
	$3,243	$2,594	$0
Ultra Clean Fuels	No activity ($0)	Ultra Clean Fuels: Initiate research through both competitive solicitations and the National Laboratory Partnership to develop technology to overcome current limitations for making very low sulfur, clean burning transportation fuels. ($9,878) (PetroStar, Research Triangle Inst., Phillips Petro, Parxair, ICRC, Envires, Conoco, Ford, 4 national laboratories)	Ultra Clean Fuels: Conduct an orderly termination of R&D using prior year funds. The R&D was implemented in FY 2001 from competitive solicitations and National Laboratory Partnerships to overcome current limitations for making very low sulfur, clean burning transportation fuels. ($0)

III. **Performance Summary**: OIL TECHNOLOGY (Cont'd)

Activity	FY 2000	FY 2001	FY 2002
	No activity. ($0)	Fund technical and program management support. ($100)	No activity. ($0)
	$0	$9,978	$0
Oil Technology, Total	$55,748	$66,874	$30,499